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ABSTRACT

In "The Invisible Computer," Donald Norman illustrates his theory of invisible computers turning into information appliances with examples of past inventions like the radio, automobile, and phonograph. Second generation computers have evolved as far as technology will allow. At the present time, the technology itself is the driving force behind the production of computers. Computers are being built for the technologists who favor the expansions of technology over ease of use. This phenomenon is described as the period of innovators, followed by early adopters (the first generation of users), late adopters, and laggards/skeptics. Educators belong to the late adopter category; due to high cost, little technological support, and inadequate strategies for integration, schools have lagged behind business in computer implementation. An alternative to the limited number of prepackaged educational software programs is gaining access to the Internet. Examples of how teachers can incorporate the Internet into their classrooms include e-mail, global classrooms, ask-an-expert, information collection, online field trips, and electronic publishing. Until computers become invisible or incorporated into everyday life, the Internet is the medium which will promote fluid interaction between machine and students. (AEF)

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Donald Norman's *The Invisible Computer* and its Implications for Education

Joanne M. Frey

According to Donald Norman in his book, *The Invisible Computer*, "Modern-day technology enslaves us as much as it empowers us" (p.165). "But the computer does not really meet our needs" (p.4). These are powerful statements from a man involved in making computers more user friendly. Norman has worked for Apple computer and Hewlett Packard, was a former Director of the Institute of Cognitive Science, and is currently professor emeritus at the University of California, San Diego and cofounder of a new computer company.

The Invisible Computer is a book anyone who has anything to do with the use of computers should read. Computer users should read this book to help them understand their everyday frustrations with the computer. Teachers should read this book to believe that at least there is some help, albeit theoretical, on the way. Norman constructs a compelling case for the eventual disappearance of the computer. He stresses that only when the computer becomes invisible will users be free from the everyday frustrations of trying to use a machine that is not really designed for them. By disappearing from view, a computer would become what Jef Raskin in the late nineteen seventies called an information appliance, much like the computers that are installed in cars, stoplights, clocks, and the like today. In order for the computer to become more useful it must become, or evolve into, an information appliance.

To build his case of invisibility, Norman discusses the history of computers. Computers have evolved into second generation machines; the PC or personal computer. Previously, computers were huge room size apparatuses which have gradually over time been modified and miniaturized into a machine that will fit in a briefcase. Although the computer's size has been modified, usage has not been simplified. "Today's technology imposes itself on us, making demands of our time and

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diminishing our control over our lives" (p.6). Life hasn't become easier for the user. In fact, Norman states that, "This is an industry that puts the device first, the customer second. The real needs of consumers are ignored" (p.4). More features and functions are added to give one the "feeling" that the product is improving.

Norman illustrates his theory of invisible computers turning into information appliances with examples of past inventions like the radio, automobile, and phonograph. These past examples are powerful reminders of machines that evolved or were adapted into their present day representations. The history of the radio and automobile give the reader clear examples of how what was viewed as a complicated and complex machine evolved into a mundane appliance; and a necessary and useful part of everyday life. It is only after this evolution that the device can be successfully demystified and used simply as a tool.

According to Norman, second generation computers have evolved as far as technology will allow. "It is time to make technology conform to the needs of the people" (p.261). Ideally, information appliances should be built with the needs and wants of human beings in mind. At the present time, the technology itself is the driving force behind the production of computers. Computers are being built for the technologists who favor the improvements or expansions of technology rather than the ease of use. Norman describes this phenomenon as the period of innovators, followed by early adopters, the first generation of users. The early adopters don't care how difficult the technology is to deal with. They will teach themselves how to use the device because some aspect of the device will offer to make their life easier. This phase is followed by the late adopters who are viewed as conservative; let's wait and see how this device will evolve to help us. The late adopters have the benefit of updated versions of the technology which was originally offered to the early adopters. Usually the device will now feature design improvements and a lower price. The last

category consists of laggards and/ or skeptics. These people are even more conservative than the late adopters. These users want little or no trouble or risk involved in their computer usage. The combination of late adopters and laggard and/or skeptics categories consists of the majority of the population who might buy the device. To make a computer attractive to these categories, the computer would have to be virtually stripped down to a few targeted functions to make it manageable and easy to use, while minimizing the risk.

At the present time, many people are very interested in the computer for access to the Internet, which is why Web TV is an example of what Norman is describing. Web TV is designed with just Internet access in mind. Users are not able to use the device for any other reason, making Web TV a very attractive alternative to purchasing and learning how to use a computer. Web TV is considerably cheaper as well.

Apple Computer has developed the iMac computer with ease of use in mind. The machine is basically geared to the conservative and laggard and/or skeptic categories. The iMac isn't a powerful computer; its only promise is ease of use especially for those people seeking Internet access.

Norman has some very interesting ideas that pertain directly to the field of education. Educators are generally seen in the late adopter category. The category just before the laggard and/or skeptic. That is not to say that all educators are in this category. Schools have been trying to include computers into their curriculum but, due to the high cost, little technological support, and inadequate strategies of how to integrate usage, schools have lagged behind business in computer implementation. School teachers face a race of catching up with their students, who in some cases, have the technology available at home. Many teachers have not been trained in computer usage, let alone in the process of integrating the computer into the classroom. Therefore, a problem of integration exists. The computer is seen as just another

subject area that requires a great deal of teacher preparation time in order to achieve a little expertise. Norman discusses user discomfort and frustration in learning the technology that is complex and frustrating to use.

Another problem inherent with computers, is determining where the technology fits. The software was designed with a wide market appeal, not with a specific or particular classroom in mind. Therefore, teachers have to adapt to the software, not vice versa. With goals and objectives to be stated and mastered by students, how do teachers find the time to research and decide what software will fit their classroom needs?

At the present time, teachers have to design and adapt their teaching style to incorporate the available technology. It is important for teachers to incorporate these marvelous devices into their classrooms, but the time and effort can take a toll on the implementation process. The public demands computers be used effectively in schools. But Norman stresses that users are doing all the work. The difficulty is built into the technology. It is a very one sided proposition. Currently, there are no specific software programs that are readily adaptable to specific classroom needs. Every classroom has a distinct personality with different student needs and ability levels. Hopefully, software will follow computers in ease of use and usefulness but at the present time they aren't easy to use. Teachers must make time to incorporate the Internet.

A viable alternative to the limited number of prepackaged educational software programs can be gaining access the Internet. This is why teachers who wish to integrate computers into existing lesson plans can focus their energy on the Internet, developing and designing assignments which would have a fluid quality to them rather than a particular piece of static software. Teachers must make time to incorporate the Internet. Some software companies are incorporating learning theories and cognitive science research into their products but many are not. Many programs are still built

using the stimulus response psychological theories, ala B.F. Skinner.

Here are a few examples of how teachers can incorporate the Internet into their classroom: Heide and Stilborne (1999) supply several examples of teaching strategies:

- Email. Have students e-mail other students in different schools, electronic pen pals called key pals, even in foreign countries
- Global Classrooms. Students can discuss a common topic
- Ask-an-Expert. Students can engage with specialists in a particular field.
- Information collection. Students can gather information about various topics. The students can help decide if the information is credible and why.
- Online field trips. Virtual trips can be taken without ever leaving the classroom
- Electronic publishing. Students can write and publish their own original works.

Heide and Stilborne include several specific lesson plans that incorporate Internet usage.

Crotchett (1997) provides teachers with suggestions for several projects involving the Internet such as: the emailing of key pals, collecting survey data from listservs, using usenet newsgroups for discussions of topics, evaluating and critiquing shareware programs for possible use, electronic publishing, surfing the World Wide Web for information, and building a Web page. Crotchett, Heide & Stilborne, Leu & Leu (1999), and Cafolla, Kauffman & Knee (1997) include Web site addresses and suggested sites for teachers and their students to visit. Crotchett stresses the need for a classroom or school-wide policy designed to ensure that students learn responsible behavior involving Internet usage.

Leu and Leu suggest setting up a classroom schedule to ensure time equity among students. The Leus also provide a step by step integration of the Internet through use of Netscape Navigator, a popular browser, to investigate the Internet. Another strategy

advocated by the Leus is creating "healthy skeptics" of students. Students will encounter a great deal of information on the Internet, however, since there is no monitoring of information, anything can be posted on the Internet. The Leus suggest that students verify information by obtaining at least two sites that contain the same information to provide a cross check of information. Another suggestion is to conduct Internet workshops to update students about Internet skills throughout the school year. These meetings can promote student sharing and learning.

Cafolla, Kauffman, and Knee guide teachers through activities integrating the World Wide Web. A brief discussion of technology is followed by examples of actual usage of the World Wide Web by teachers to enhance learning experiences for their students. Netscape Navigator is highlighted as a browser, a software program that searches the Internet, with several activities and Web sites included for easy teacher reference.

These are just a few examples of how the Internet can help promote learning and critical thinking. The Internet gets larger and larger each day. These ideas will be only the beginning to the learning opportunities afforded by the Internet. Until computers become invisible or incorporated into everyday life, the Internet is the medium which will promote fluid interaction between machine and all students.

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